

FUNCTIONS Unit Review - Alg 2 BE

Idea 1 - Function?

- 1) no 2) no 3) yes 4) yes 5) no 6) no
7) B - this point would repeat an x-value

Idea 2 - Evaluating

- 1) $h(7) = 8(7) = \boxed{56}$ 2) $g(d+4) = 3(d+4)^2 - 5(d+4) + 7$
 $= 3(d^2 + 8d + 16) - 5d - 20 + 7$
 $= 3d^2 + 24d + 48 - 5d - 20 + 7$
 $= \boxed{3d^2 + 19d + 35}$
- 3) $f(-2) = \frac{(-2)^2 - 3(-2) + 6}{-2 - 1}$
 $= \frac{4 + 6 + 6}{-3} = \boxed{-\frac{16}{3}}$
- 4) $3(2x - 5) - 1$ 5) $-4 = \frac{1}{2}(4) + b$ $f(20) = \frac{1}{2}(20) - 6$
 $= 6x - 15 - 1$ $-4 = 2 + b$ $= 10 - 6$
 $= \boxed{6x - 16}$ $b = -6$ $= \boxed{4}$
- 6) $f(-2) = 2$ (The point $(-2, 2)$ is on the graph)
7) $f(2) = 2$ 8) $f(5) = 3$

Idea 3 - Domain + Range

- 1) D: $[-5, \infty)$ 2) D: $(-\infty, \infty)$ 3) D: $x \neq -1$
 $-5 \leq x$ \mathbb{R}
R: $(-\infty, \infty)$ R: $[2, \infty)$ R: $y \neq 1$
 \mathbb{R} $2 \leq x < 4$

4) $D: \{-5, -1, 3\}$ $R: \{4, 7, 8\}$

5) $X \neq \psi$ $\textcircled{8, 7}$ $X \neq \frac{1}{7}$

6) $D: (\# \text{ cars}) \{1, 2, 3, 4, 5\}$
 $R: (\# \text{ minutes}) \{4, 8, 12, 16, 20\}$

7) $D: \begin{matrix} x+5 \geq 0 \\ |x| \geq -5 \end{matrix}$
 $R: [0, \infty)$
 $y \geq 0$

8) $D: \begin{matrix} x-9 \neq 0 \\ x \neq 9 \end{matrix}$
 $R: y \neq 0$

9) $D: \mathbb{R}$
 $R: [0, \infty)$
 $y \geq 0$

10) $D: \mathbb{R}$
 $R: \mathbb{R}$

Idea 4 - Transformations

1) If $a < 0$, reflect over x-axis

If $|a| < 1$, vertical shrink If $|a| > 1$, vertical stretch

2) If $b < 0$, reflect over y-axis

If $|b| < 1$, horizontal stretch. If $|b| > 1$, horizontal shrink

3) shift right and left

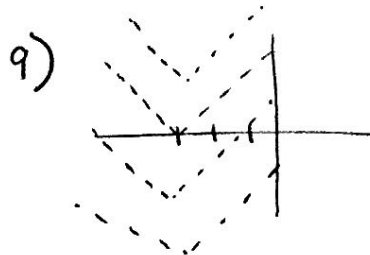
4) shift up and down

5) $3(x+2)^2 - 4$
 \downarrow vertical stretch \downarrow shift left \downarrow shift down

6) $-4e^{x-1}$
 \downarrow reflect over x \downarrow vert stretch \downarrow shift right

7) $0.8\sqrt{-(x+5)} + 3$
 \downarrow vert shrink \downarrow reflect over y \downarrow shift left \downarrow shift up

8) $-3\sin(\frac{1}{2}x) + 5$
 \downarrow reflect over x \downarrow vert stretch \downarrow horiz stretch \downarrow shift up





10) True if $k \geq 0$

False if $k \leq 0$ (Then the equation would be $f(x+k)$ and the graph would shift left not right)

Idea 5 - Even, Odd, Neither

1) $-x$ (find $f(-x)$)

2) y -axis 

3) x -axis 

4) $f(-x) = 2(-x)^2 - 3(-x)$
 $= 2x^2 + 3x$

Neither

5) $f(-x) = 3(-x)^2 + 7$
 $= 3x^2 + 7$

Even

6) $f(-x) = (-x)^3 - 6(-x)$
 $= -x^3 + 6x$

Odd

7) $f(-x) = \frac{1}{2}(-x)^5 + 3$
 $= -\frac{1}{2}x^5 + 3$

Neither

Idea 6 - Function Families

1) F, cc $D: x > 0$ $R: y > 0$

2) C, ee $D: \mathbb{R}$ $R: \mathbb{R}$

3) G, ff $D: \mathbb{R}$ $R: \mathbb{R}$

4) A, hh $D: \mathbb{R}$ $R: [-1, 1]$

5) D, aa $D: \mathbb{R}$ $R: [0, \infty)$

6) E, ii $D: x \neq 0$ $R: y \neq 0$

7) I, dd $D: \mathbb{R}$ $R: \mathbb{R}$

8) B, bb $D: (0, \infty)$ $R: \mathbb{R}$

9) H, gg $D: \mathbb{R}$ $R: [0, \infty)$

Idea 7 - Combine w/ 4 operations

$$1) (f+h)(x) = 9x - 4 + 8x = 17x - 4$$

$$2) (f-g)(x) = 9x - 4 - (3x^2 - 5x + 7) = -3x^2 + 14x - 11$$

$$3) (h \cdot f)(x) = 8x(9x - 4) = 72x^2 - 32x$$

$$4) \left(\frac{g}{f}\right)(x) = \frac{3x^2 - 5x + 7}{9x - 4}$$

$$5) (h-f)(x) = 8x - (9x - 4) = -x + 4$$

$$6) (h \cdot g)(x) = 8x(3x^2 - 5x + 7) = 24x^3 - 40x^2 + 56x$$

$$7) 2g(x) + f(x) = 2(3x^2 - 5x + 7) + 9x - 4 \\ = 6x^2 - 10x + 14 + 9x - 4 = 6x^2 - x + 10$$

8) Multiple correct answers!

$$\text{Ex: } f(x) = 5x^2 - 7x + 3 \quad g(x) = -2x^2 + 2$$

$$\text{Ex: } f(x) = x^2 + 3x - 1 \quad g(x) = 2x^2 - 10x + 6$$

Idea 8 - Composition

$$1) h \circ f = 8(9x - 4) = 72x - 32$$

$$2) f \circ h = 9(8x) - 4 = 72x - 4$$

$$3) h(-4) = 8(-4) = -32 \quad f(-32) = 9(-32) - 4 = -292$$

$$4) h[g(2)] = 3(2)^2 - 5(2) + 7 \quad h(9) = 8(9) = 72 \\ = 12 - 10 + 7 = 9$$

$$5) g(f(2)) = g(10) = 3$$

$$f(g(1)) = f(6) = 5$$

Idea 9 - Solutions

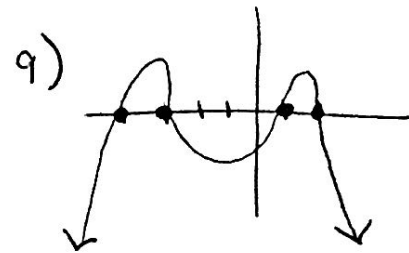
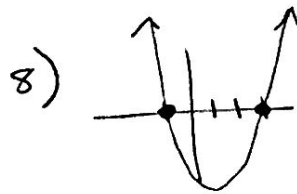
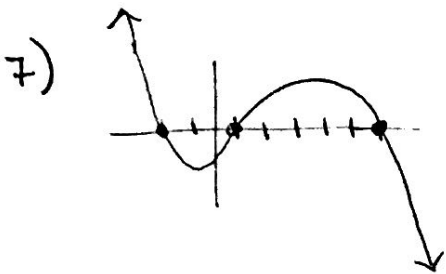
1) A. $x = -2, -1, 1, 2$ B. 4th degree C. $(x+2)(x+1)(x-1)(x-2)$

2) A. $x = -3, -2, -1, 0, 1, 2, 3$ B. 7th degree

C. $(x+3)(x+2)(x+1)x(x-1)(x-2)(x-3)$

3) A. $x = -4, -1, 2$ B. 3rd degree C. $(x+4)(x+1)(x-2)$

4) $x = 0$ $x = 4$ $x = -3$ 5) $x = 0, -5, 6$ 6) $x = \frac{1}{3}, -4$



Idea 10 - Inverse Functions

1) $f^{-1} = \{(2, -4), (7, 6), (-1, 5)\}$

2) $y = -2x + 5$

$x = -2y + 5$

$x - 5 = -2y$

$\frac{x-5}{-2} = y \quad \boxed{f^{-1}(x) = -\frac{1}{2}x + \frac{5}{2}}$

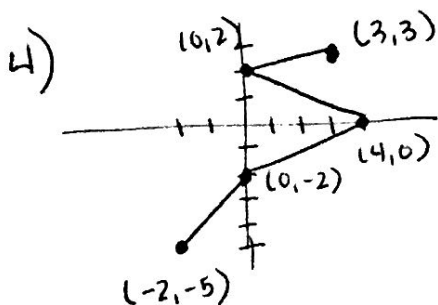
3) $y = \frac{x^5 + 9}{5}$

$x = \frac{y^5 + 9}{5}$

$5x = y^5 + 9$

$5x - 9 = y^5$

$\boxed{j^{-1}(x) = \sqrt[5]{5x - 9}}$



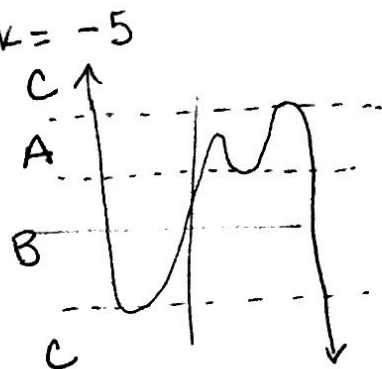
Idea 11 - Solutions & Systems

- 1) $(-3, -8)$ and $(2, -3)$ 2) $(2, 3)$
 3) $(-1, -1)$ and $(1, 1)$ 4) $(0, -2)$ and $(2, 10)$

Idea 12 - Graph Features

1) $k = 3$ $k = 4$ B. $k = -2$ $k = 2$ $k = -5$

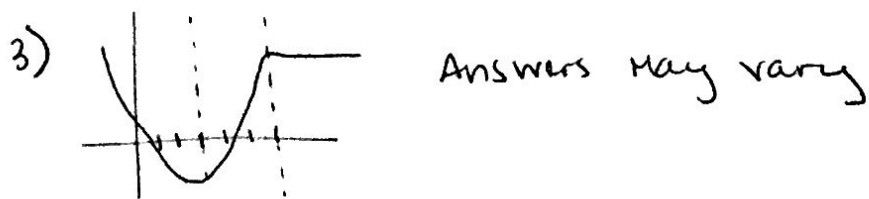
C. $k = 7$ $k = -8$



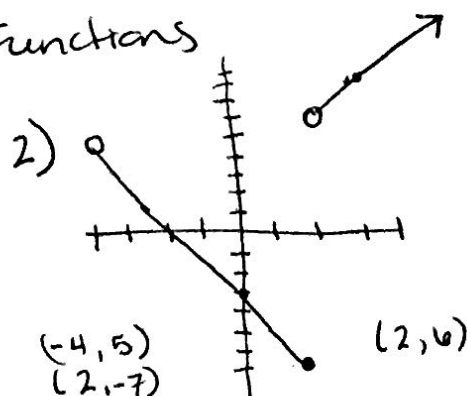
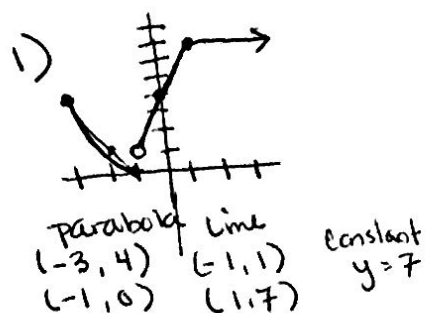
2) A. $(-\infty, -3)$ $(-1, 2)$ $(4, \infty)$

B. $(-3, -1)$ $(2, 4)$

C. $(-3, 2)$ $(2, 1)$ D. $(-1, -3)$ $(4, -1)$ E. -2



Idea 13 - Piecewise Functions



3)
$$\begin{cases} x+3 & \text{if } x \leq 1 \\ -6x+10 & \text{if } 1 < x \leq 2 \\ x-4 & \text{if } x > 2 \end{cases}$$

4)
$$\begin{cases} 1 & \text{if } x < -1 \\ x^2 - 3 & \text{if } -1 \leq x < 2 \end{cases}$$